The questions presented in this document are from the previously secured 2006 Grade 9 Mathematics Achievement Test and are representative of the questions that form these tests. These questions are released by Alberta Education for teacher and student use.

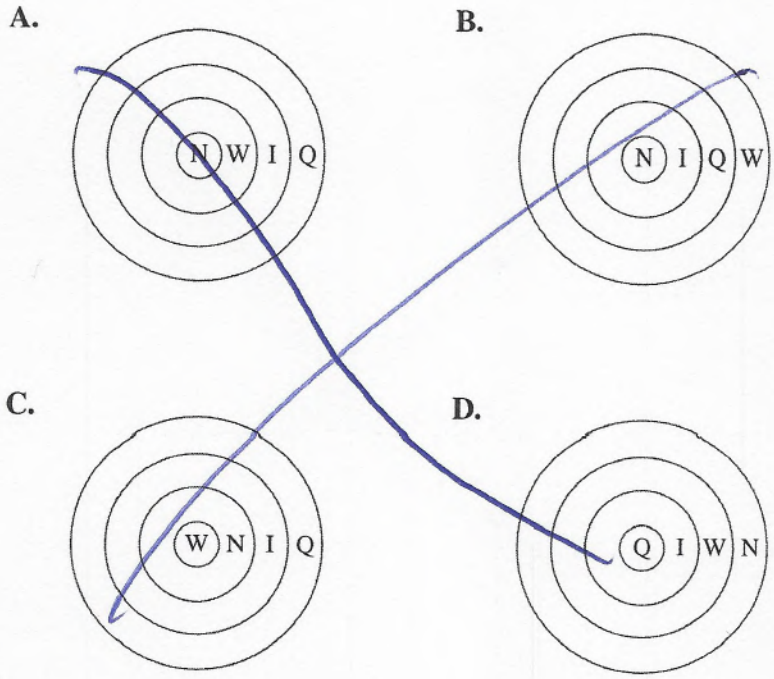
Solutions

Grade 9 Achievement Test

2006

Mathematics

1. Which of the following diagrams correctly represents the relationship among integers (I), natural numbers (N), whole numbers (W), and rational numbers (Q)?



2. Which of the following expressions represents $(-5)(-5)(-5)(-5)$?

- Reads (-5) four times

A. $(-5)^{-4}$
B. $(-5)^{4}$
C. 5^{-4}
D. -5^{4}

3. The simplified form of $6(m - 2n) - (4m - 5n)$ is

$6(m-2n) = 6m - 12n$ ADD the opposite

$(6m - 12n) - (4m - 5n)$

$(6m - 12n) + (-4m + 5n) = 6m - 4m - 12n + 5n$

$= 2m - 7n$

A. $10m - 7n$
B. $10m - 17n$
C. $2m - 17n$
D. $2m - 7n$

Use the following algebra-tile legend and algebra-tile model to answer question 4.

LEGEND:

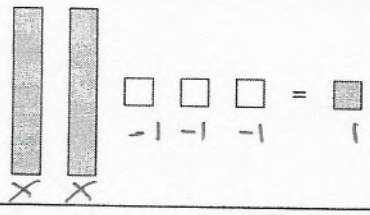
Shaded is positive

Unshaded is negative

= 1

= x

MODEL:



$2x - 3 = 1$

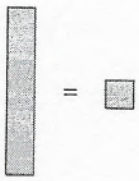
$2x = 1 + 3$

4. The solution to the equation represented by the algebra-tile model above is

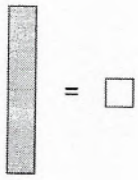
$2x = 4$

$\boxed{x = \frac{4}{2} = 2}$

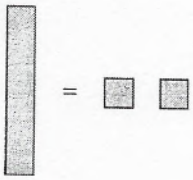
A.



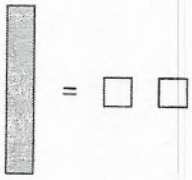
B.



C.

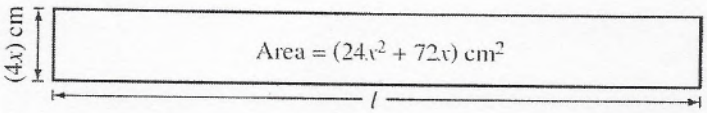


D.



5. Item not released.

Use the following diagram to answer question 6.



6. The length, l, of the rectangle shown above is

A. $(6x + 18)$ cm
B. $(20x + 68)$ cm
C. $(6x^2 + 18x)$ cm
D. $(24x^2 + 68x)$ cm

Area of Rectangle = $b \times h$

$24x^2 + 72x = l \times 4x$

So, $l = \frac{24x^2 + 72x}{4x} = 6x + 18$

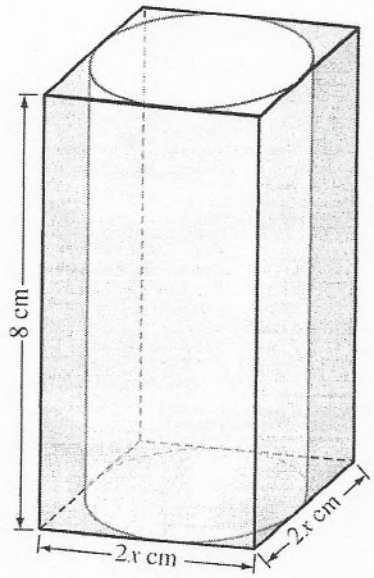
$\frac{24x^2}{4x} + \frac{72x}{4x}$

Proof

$(4x)(6x + 18) = (24x^2 + 72x)\ cm^2$

Use the following information to answer question 7.

The volume of the rectangular glass box shown below is 288 cm^3.



The formula used to calculate the surface area of a cylinder is:

$$\text{Surface Area} = 2\pi r^2 + 2\pi rh$$

7. What is the surface area of the cylinder inside the glass box above, to the nearest square centimetre?

A. 528 cm^2

B. 207 cm^2

C. 169 cm^2

D. 126 cm^2

diameter $= 2x = 2(3) = 6$

Radius $= x = 3$

$SA = 2\pi(3)^2 + 2\pi(3)(8)$

$= 18\pi + 48\pi = 66\pi = 207.34$

$\approx 207\ cm^2$

Volume of Box = (SA base) · height

$288 = (2x \cdot 2x) \cdot 8$

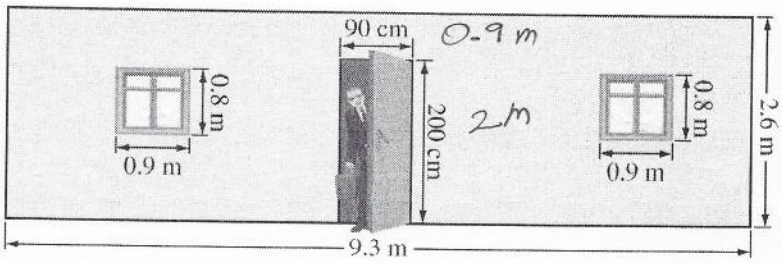
$288 = 4x^2 \cdot 8 \Rightarrow \frac{288}{8} = 4x^2$

$\frac{288}{8 \cdot 4} = x^2$

$\frac{288}{32} = 9 = x^2$

or $\boxed{x = \sqrt{9} = 3}$

Use the following diagram to answer question 8.



8. Rounded to the nearest tenth of a square metre, what is the area of the wall shown above, not including the area of the windows and the door?

A. 24.2 m^2

B. 22.4 m^2

C. 21.7 m^2

D. 20.9 m^2

Area = $(9.3 \times 2.6)\ m^2 = 24.18\ m^2$

window 1 = $(0.9) \times (0.8) = 0.72\ m^2$ = window 2

door = $(0.9) \times (2.0) = 1.8\ m^2$

Total Area = Area − (window 1 + window 2 + door) Area of

$= 24.18\ m^2 - (0.72\ m^2 + 0.72\ m^2 + 1.8\ m^2)$

$= 24.18\ m^2 - 3.24\ m^2$

$= 20.94 \approx 20.9\ m^2$

Numerical Response

1. In his toolbox, a construction worker has twice as many screwdrivers as wrenches, and 5 fewer hammers than wrenches. If he has 19 tools in his toolbox, then the number of wrenches in his toolbox is __6__.

(Record your answer in the numerical-response section on the answer sheet.)

$SD = 2 \times w$

$h = w - 5$

$SD + h + w = 19$

$2w + w - 5 + w = 19$

$4w = 19 + 5$

$4w = 24$ | $w = 24/4 = 6$

6 w

12 SD

1 h

Use the following information to answer question 9.

> Simone works in a restaurant four hours a day for three days a week. She earns $9.50 per hour, plus tips.

9. Which of the following expressions represents Simone's earnings in dollars for one week, E, where t represents the total amount of tips she earns that week?

A. $E = 4(9.50 + t)$

B. $E = 4(9.50) + t$

C. $E = 12(9.50 + t)$

D. $E = 12(9.50) + t$

4h/d → 3×w

Each day → 4(9.50) = $38 × 3 days

$\boxed{12(9.5)+t}$ 114 $ in 3 days

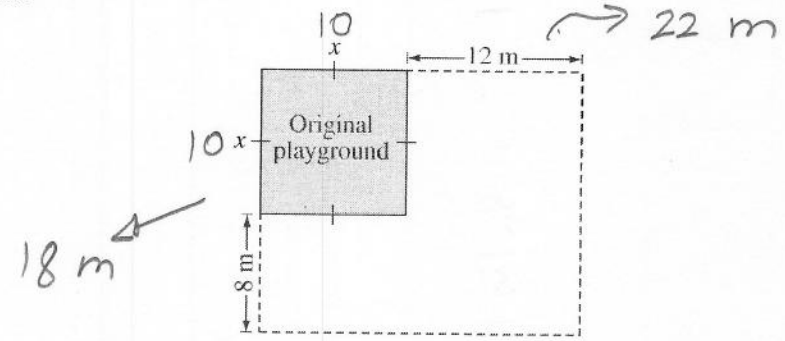
tips

hours

$ per hour

Use the following information to answer question 10.

> A square playground is being enlarged. One side of the original square playground is being increased by 12 m. The other side is being increased by 8 m.



10. If $x = 10$ m, then the total area of the playground when it is enlarged will be

A. 396 m^2

B. 196 m^2

C. 116 m^2

D. 96 m^2

Area = l × w =

$\underbrace{(10+12)}_{22\text{ m}}\text{m} \times \underbrace{(10+8)}_{18\text{ m}}\text{m} =$

396 m^2

11. A warm-up pool contains 96 m^3 of water. Each day, 0.03 mL of chlorine is added to the pool for every litre of water in it. Given that 1 m^3 = 1 000 L, the amount of chlorine added to the pool each day is

A. 2.88 mL
B. 30 mL
C. 2 880 mL
D. 96 000 mL

12. If $x = 2$ and $y = 3$, then $2x^4y^3 - 9x^3y^0$ is equal to

A. 864
B. 792
C. 621
D. 424

$2(2)^4(3)^3 - 9(2)^3 3^0$

$2 \quad 16 \quad 27 \qquad 9 \quad 8 \quad 1$

So

$(2 \cdot 16 \cdot 27) - (9 \cdot 8 \cdot 1) = 864 - 72$

$= 792$

13. **Item not released.**

14. Pierre's class and Corissa's class have the same ratio of boys to girls. Pierre's class has 18 boys and 12 girls. If Corissa's class has 15 boys, then how many girls are in Corissa's class?

A. 6
B. 9
C. 10
D. 15

Pierre

$18:12 \rightarrow \frac{18}{12} = 1.5$

Corissa $\rightarrow \frac{15}{x} = 1.5$

$x = \frac{15}{1.5} = 10$

So

$\frac{(B)\,18}{(g)\,12} = 1.5 = \frac{15}{10}$

Use the following information to answer numerical-response question 2.

The following charts show average temperatures for each month in four locations.

Chart 1

Month (x)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature °C (y)	–4.5	–11.4	–20.5	–24.0	–25.6	–26.0	–28.3	–29.7	–28.1	–21.3	–11.4	–4.8

Chart 2

Month (x)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature °C (y)	9.8	11.4	13.0	15.4	17.2	17.8	17.3	15.2	13.5	12.2	10.2	8.5

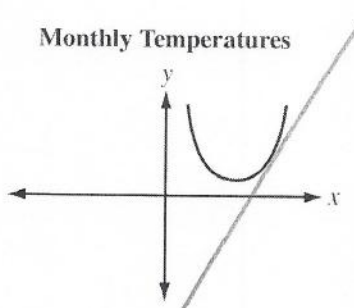
Chart 3

Month (x)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature °C (y)	–18.4	–15.4	–10	–5.5	–3	–0.1	–3	–9	–11	–16	–19	–20

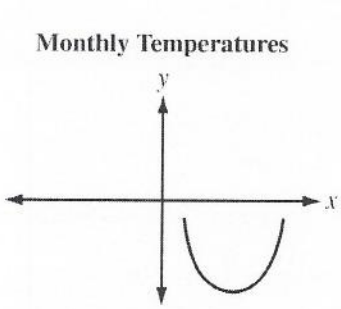
Chart 4

Month (x)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature °C (y)	29	23	19	15	8	3	7	16	18	21	24	28

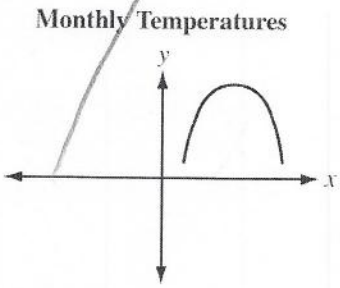
P.



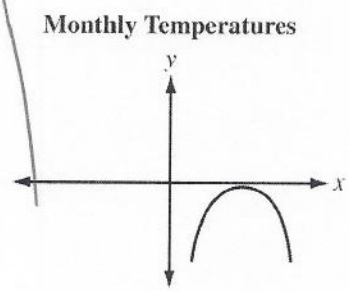
Q.



R.



S.



Numerical Response

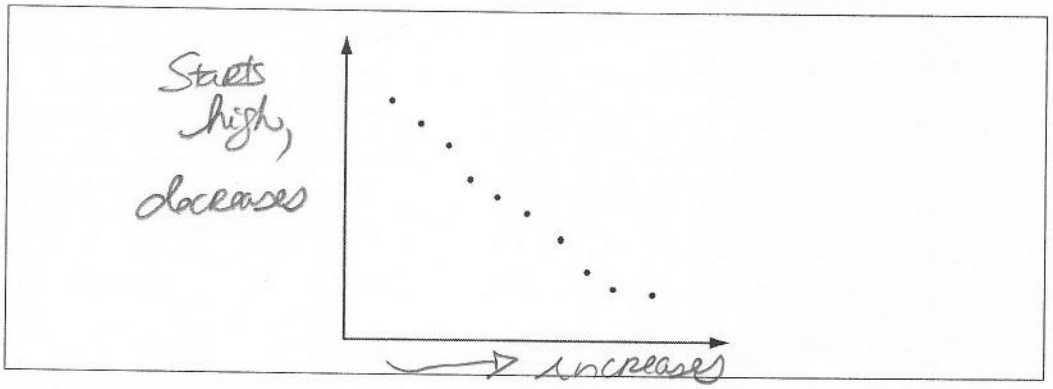
2. Match each of the numbers of the charts on the previous page with the letter of the graph that best represents the information in the chart.

Chart:	_____	_____	_____	_____
Graph:	**P**	**Q**	**R**	**S**

(Record all **four digits** of your answer in the numerical-response section on the answer sheet.)

_____

Use the following scatter plot to answer question 15.



15. The information displayed in the scatter plot could represent which of the following relationships?

↗ calories would increase

A. The distance a person runs versus the number of calories that he or she burns

B. The number of hours a person works versus the money that he or she is paid (constant)

C. The number of minutes a candle is lit versus the height of the candle

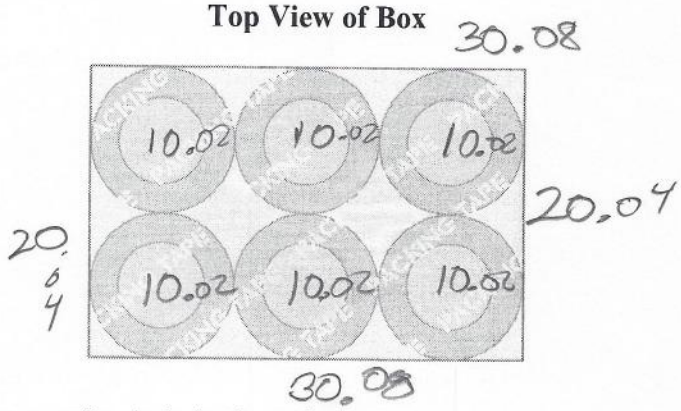
D. The distance a car travels versus the speed of the car

↓ the height of candle decreases

Use the following information to answer question 16.

Packing tape is stored in a rectangular box with a clear lid, as shown below.

Top View of Box



The circumference of a circle is $C = \pi d$.

16. If the circumference of each roll of tape is 31.5 cm, then the perimeter of the clear lid of the box, to the nearest tenth of a centimetre, is

A. 189.0 cm

B. 100.3 cm

C. 60.2 cm

D. 50.2 cm

$31.5\text{ cm} = \pi d$

d each tape: $\frac{31.5\text{ cm}}{\pi} = 10\text{ cm}$

100.24

---

17. If the angles of a triangle have a ratio of 1:2:6, then the measure of the largest angle is

~~**A.**~~ 20°

~~**B.**~~ 40°

C. 120°

~~**D.**~~ 140°

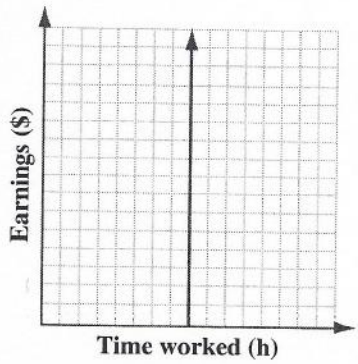
1 : 2 : 6 (20×2)

120 ÷ 6 = 20

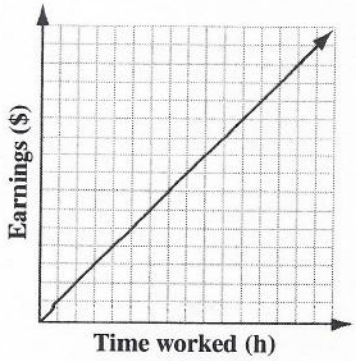
So Ratio: 20 : 40 : 120°

18. Tiarra earns $8.50/h at her part-time job. Which of the following graphs shows the relationship between the number of hours that she works and the amount of money that she earns?

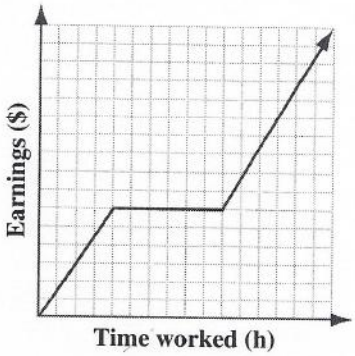
A.



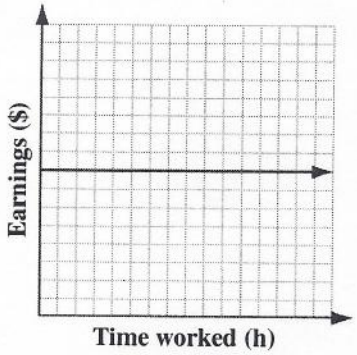
B.



C.



D.



19. A DVD player is advertised for 20% off the regular price of $119.99. What is the final cost of the DVD player after 7% GST is applied?

A. $108.31

B. $106.99

C. $104.39

D. $102.71

10% 119.99 = 11.9̄

20% = 11.9̄ + 11.9̄ = 23.8

(119.99 - (24.2) = 96 + 6.73 = 102.72

96.19 × (0.07%) = 6.73

6.72

20. If $x = 2y$, then what is the value of $\frac{12x + 4y}{2y}$?

A. 28
B. 24
C. 14
D. 12

$$\frac{12(2y) + 4y}{2y} = \frac{24y + 4y}{2y} = \frac{28\cancel{y}}{2\cancel{y}} = 14$$

21. If $x = 5.0 \times 10^{-23}$ and $p = 2.0 \times 10^{-56}$, then $\frac{x}{p}$ is

A. 2.5×10^{79}
B. 2.5×10^{33}
C. 2.5×10^{-33}
D. 2.5×10^{-79}

Numerical Response

3. If $\frac{(n^3)^4}{(n^6)(n^2)} = 4\,096$, then n equals _____.

(Record your answer in the numerical-response section on the answer sheet.)

$$\frac{n^{12}}{(n^6)(n^2)} = \frac{n^{12}}{n^{6+2}} = \frac{n^{12}}{n^8}$$

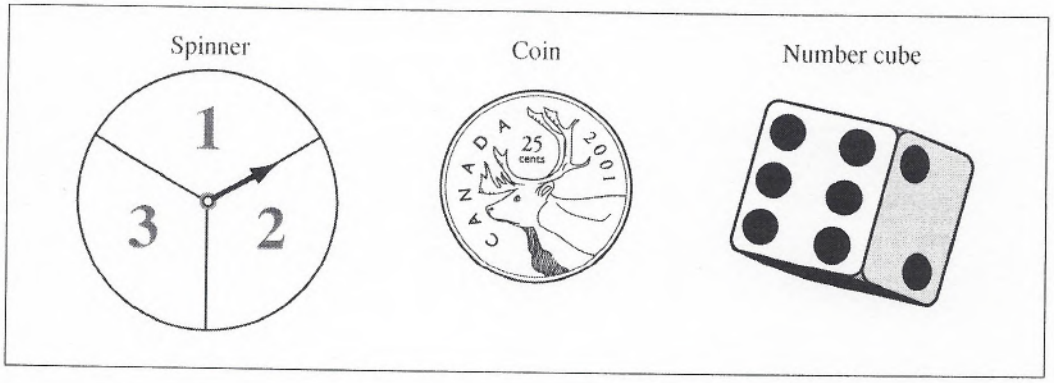
$n = 12 - 8$

$n = 4$

$n^4 = 4096$

$n = \sqrt[4]{4096} \Rightarrow \boxed{n = 8}$

Use the following illustrations to answer question 22.



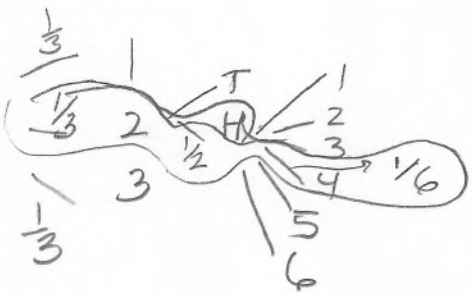
22. What is the probability on the first try of spinning a 2, of flipping a coin that lands on heads, and of rolling a 4?

A. $\frac{1}{36}$

B. $\frac{1}{12}$

C. $\frac{1}{6}$

D. $\frac{3}{5}$



$$\begin{array}{ccccc} 2 & & H & & 4 \\ \downarrow & & \downarrow & & \downarrow \\ \frac{1}{3} & \times & \frac{1}{2} & \times & \frac{1}{6} = \frac{1}{36} \end{array}$$

23. Kassidy has been hired to survey people in her town to determine if a new swimming pool should be built. The **most** representative sample for Kassidy to use for the survey is a random sample from

A. community members

B. students of the local school • very narrow point of view

C. the town's business owners

~~**D.**~~ members of the local diving club Biased

Use the following information to answer question 24.

> Ali plays basketball on Monday, Tuesday, Wednesday, and Thursday. She plays basketball for 42 minutes on Monday, 32 minutes on Tuesday, and 50 minutes on Wednesday.

24. If the average number of minutes that Ali played basketball from Monday to Thursday was 45 minutes, then how many minutes did she play basketball on Thursday?

A. 56

B. 42

C. 41

D. 31

Mon → 42
Tues → 32
Wed → 50

$$\frac{42+32+50+?}{4} = 45$$

$$\frac{74+50+?}{4} = 45$$

$$\frac{124+?}{4} = 45$$

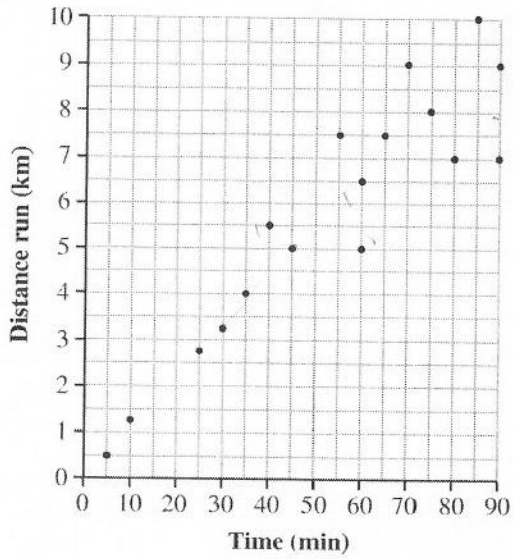
$? = (45 \times 4) - 124$

$? = 180 - 124$

$? = 56$

Use the following scatter plot to answer question 25.

Data Recorded by Members of a Running Club



25. Which of the following conclusions can be made based on the above data?

A. The farther a person runs, the faster that person is able to run.
B. The harder a person trains, the faster that person is able to run.
C. The more times a person runs, the longer the race that person can run.
D. The longer the time a person runs, the farther that person is able to run.

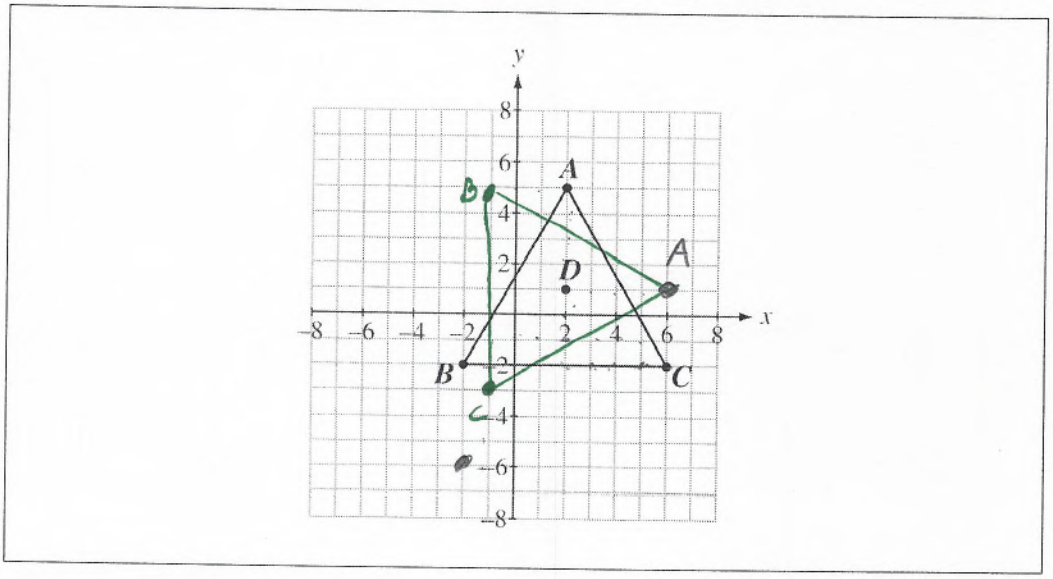
26. Kim and Jan scored a total of 234 points in a game. Jan scored 10 more points than Kim. If Kim's score is represented by x, then an equation that represents the total points scored by Kim and Jan is

A. $x - 10 = 234$
B. $x + 10 = 234$
C. $2x - 10 = 234$
D. $2x + 10 = 234$

$J = 10 + K$ $(10 + x)$
$J + K = 234$
$J + x = 234$
But $2x + 10$
$10 + x + x = 234$
$2x = 234 - 10$
$2x = 224$
$x = 112$

122
112
234

Use the following diagram to answer question 27.



27. If the triangle ABC rotates 90° clockwise around point D, then the coordinates of C' will be

A. (6, –2)

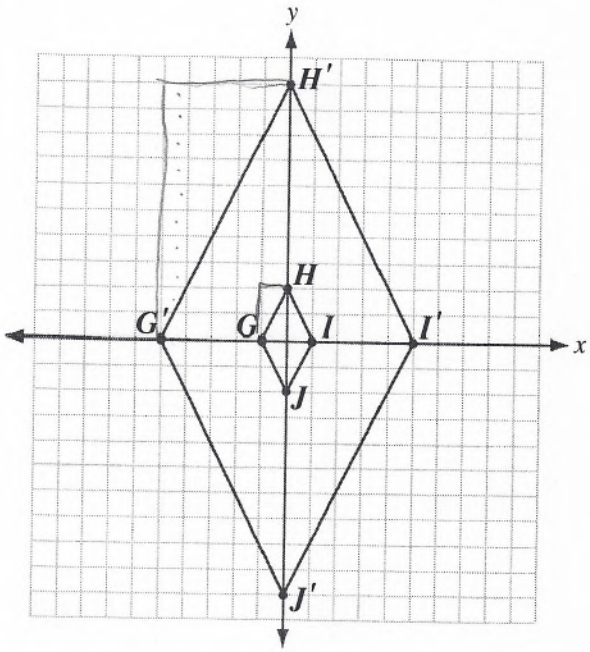
B. (1, –3)

C. (–1, –3)

D. (–2, 6)

Use the following information to answer question 28.

The image $GHIJ$ has been dilatated to form the new image $G'H'I'J'$, as shown on the graph below.



28. The scale factor of this dilatation is

A. $\frac{1}{4}$

B. $\frac{1}{5}$

C. 4

D. 5

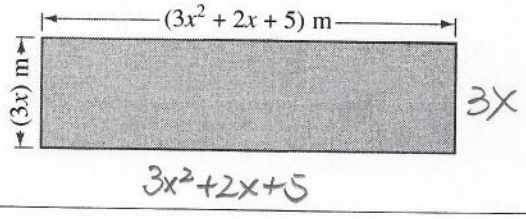
$GH \rightarrow G'H'$ New

Scale factor $= \frac{10}{2} = 5$

old

Use the following information to answer question 29.

A rectangle and its dimensions are shown below.



29. The expression that represents the perimeter of the rectangle is

A. $(3x^2 + 5x + 5)$ m

B. $(6x^2 + 7x + 10)$ m

C. $(6x^2 + 10x + 10)$ m

D. $(12x^2 + 2x + 5)$ m

Perimeter: $3x + 3x^2+2x+5 + 3x + 3x^2 + 2x + 5$

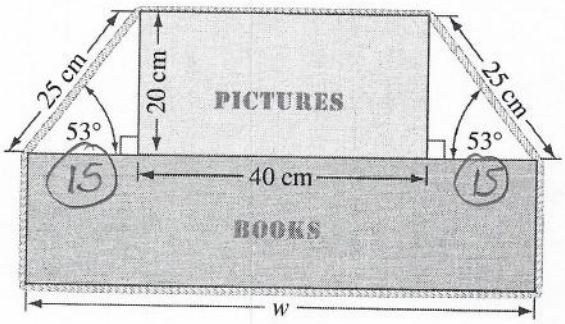
Rewrite:

$\underbrace{3x^2 + 3x^2}_{} + \underbrace{3x + 3x + 2x + 2x}_{} + 5 + 5$

Perimeter = $\boxed{6x^2 + 10x + 10}$ m

Use the following information to answer question 30.

Two boxes are stacked and tied together with rope. The length of the rope from the top of the box labelled **BOOKS** to the top of the box labelled **PICTURES** is 25 cm and forms an angle of elevation of 53°, as shown below.



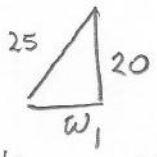
30. What is the width, w, to the nearest centimetre, of the box labelled **BOOKS**?

A. 45 cm

B. 55 cm

C. 70 cm

D. 90 cm



$w_1 = \sqrt{(25)^2-(20)^2} = \sqrt{625-400} = \sqrt{225} = 15$

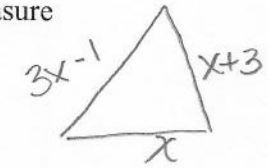
then the width is

$15 + 40 + 15 = 70$ cm

Use the following information to answer question 31.

The sides of a particular triangle measure

- $(3x - 1)$ cm
- $(x + 3)$ cm
- (x) cm



31. If the perimeter of the triangle is 66 cm, then the length of the shortest side of the triangle is

A. 12.8 cm

B. 13.6 cm

C. 37.4 cm

D. 38.6 cm

$66 = (3x-1) + (x+3) + x$

$66 = 3x - 1 + x + 3 + x$

$66 = 3x + x + x - 1 + 3$

$66 = 5x + 2$

$5x = 66 - 2 \Rightarrow 5x = 64$

$x = \frac{64}{5} = 12.8$ cm

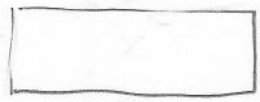
32. If the perimeter of a rectangle is 32 cm, then the dimensions that would give the greatest possible area are

A. 1 cm by 15 cm

B. 1 cm by 31 cm

C. 8 cm by 8 cm

D. 16 cm by 16 cm



Perimeter = 32

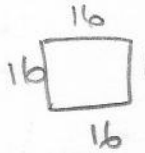
Area = 15 cm2 therefore

Area = 31 cm2

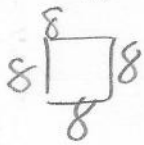
Area = 8·8 = 64 cm2

Area = 16·16 = 256 cm2

But



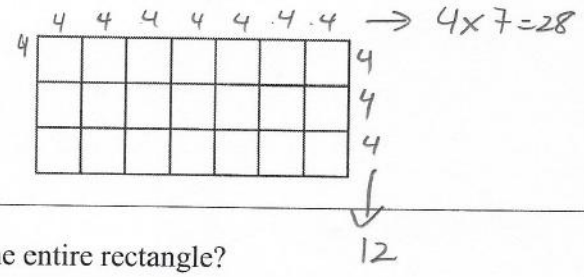
is not a Rectangle



is not a Rectangle

Use the following information to answer question 33.

Each small square below has an area of 16 cm^2.



33. What is the perimeter of the entire rectangle?

A. 168 cm

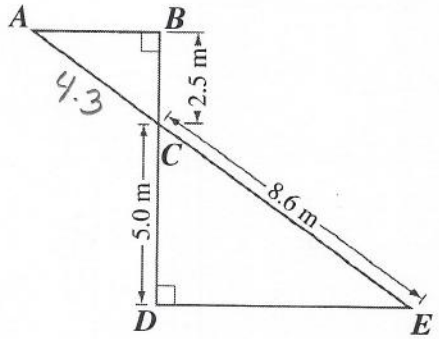
B. 160 cm

C. 84 cm

D. 80 cm

Perimeter = 12 + 12 + 28 + 28
24 + 56
= 80

Use the following diagram to answer numerical-response question 4.



Numerical Response

4. If ΔABC and ΔEDC are similar triangles, then what is the length, to the nearest tenth of a metre, of **segment** AE?

(Record your answer in the numerical-response section on the answer sheet.)

$\frac{5.0}{8.6} = \frac{2.5}{AC} \Rightarrow AC = \frac{(8.6)(2.5)}{(5.0)}$

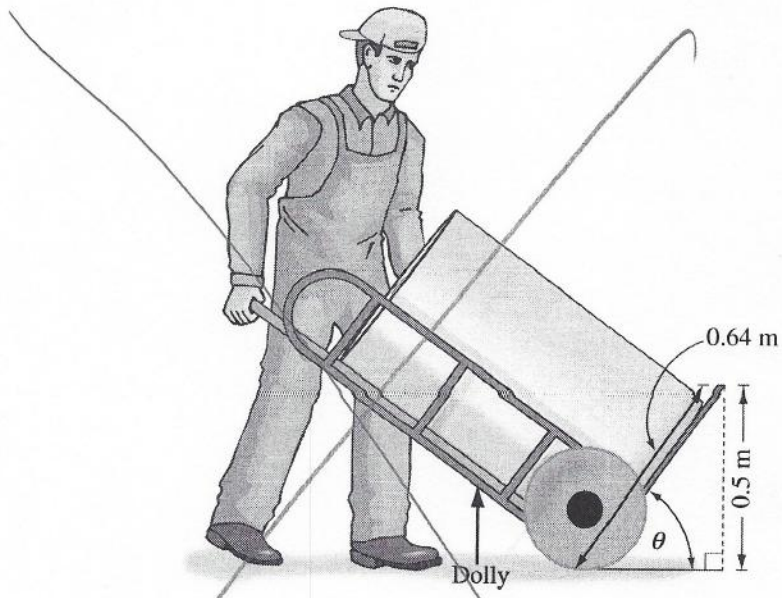
$AC = \frac{21.5}{5} = 4.3$

$AE = AC + CE$

$4.3 + 8.6 = 12.9$ m

Use the following information to answer question 34.

A mover places a cylindrical container on a dolly, as shown below.



34. The angle of elevation, θ, from the base of the dolly to the ground, to the nearest tenth of a degree, is

A. 52.0°

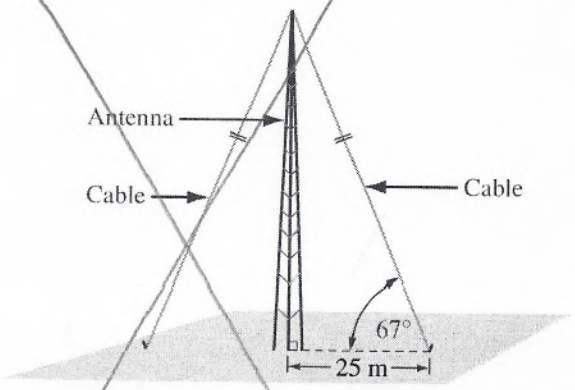
B. 51.4°

C. 38.6°

D. 38.0°

Use the following information to answer question 35.

An antenna that is perpendicular to the ground is supported by cables, as shown below. The cables are attached to the top of the antenna and anchored to the ground 25 m from the base of the antenna. The angle of elevation of the cables from the ground to the top of the antenna is 67°.



35. The height of the antenna, to the nearest metre, is

A. 27 m

B. 59 m

C. 64 m

D. 75 m

36. Which of the following number lines represents the solution to the inequality $4x - 12 > 8x + 4$ when x is a rational number?

A. $x \geq 4$

B. $x > 4$

C. $x \leq -4$

D. $x < -4$

$4x - 12 > 8x + 4$

$-4 - 12 > 8x - 4x$

$-16 > 4x \Rightarrow -\frac{16}{4} > x$

$\boxed{-4 > x}$

or

$\boxed{x < -4}$

37. Which of the following numbers is an irrational number?

R **A.** $5\frac{1}{3} = \frac{16}{3}$ fraction

R **B.** 4^{-2} $\frac{1}{4^2} = 0.0625$

C. 3.142…

R **D.** $0.5\overline{23}$

Irrational numbers

↳ non-Repeating
non-terminating
decimals

Rational Numbers

- any number that can be written as a fraction
- Repeating or terminating decimals

38. Expressed in scientific notation, the product of 0.000 000 42 × 5 000 000 000 000 is

A. 2.1×10^3
B. 2.1×10^4
C. 2.1×10^5
D. 2.1×10^6

Use the following information to answer question 39.

> A restaurant sells small sandwiches for \$3 each and large sandwiches for \$5 each. Last weekend, the restaurant sold 300 sandwiches for a total of \$1 210.

39. How many **small** sandwiches did the restaurant sell last weekend?

A. 140
B. 145
C. 150
D. 155

S = \$3 L = \$5 L = S + 2

S + L = 300

3S + 5L = 1210

3S + 5(S+2) = 1210

3S + 5S + 10 = 1210

8S = 1210 − 10

8S = 1200/8

$\boxed{S = 150}$

If S = 150 then L = 150

Prove

3(150) + 5(150)

450 + 750

1200

S = 300 − L

Numerical Response

5. Brent is 7 years younger than Gail. In 3 years, the sum of their ages will be 83. What is Brent's age now?

(Record your answer in the numerical-response section on the answer sheet.)

B = G − 7

B − G = −7 ⇒ B = G + 7

B + G =

$\boxed{G + 7 = B}$

3 years

B + 3

B + G = 83

(G + 7) + 3

G + 7 + 3 + G + 3 = 83

2G + 13 = 83

2G = 83 − 13

2G = 70

G = 70/2 = 35

So $\boxed{B = G - 7 \Rightarrow 35 - 7 = (28)}$

Prove (28 + 3) + (35 + 3) = 83

31 + 38

40. A gas station gives its customers 5 reward points for every litre of gas that they purchase. If gas is 75.6¢/L and the total cost of a purchase is \$16.18, then the total number of reward points that the customer will receive, to the nearest 5 points, is

A. 80
B. 105
C. 325
D. 380

$\frac{\$16.18}{75.6} \rightarrow \frac{1618 \text{ cents}}{75.6 \text{ cents}} = 21.4$ Liters

$\$16.18 = \$16.18 \times 100 \text{ cents}/\$ = 1618 \text{ cents}$

$\frac{1618 \text{ cents}}{75.6 \text{ cents}} = 21.40$ L purchased

$(21.40 \text{ L}) \times 5 \text{ points} = 107$

41. There are 125 entry forms in a draw box. If 15 of the entry forms have Alan's name on them, then what is the probability that the first entry form randomly selected from the draw box will be labelled with Alan's name?

A. $\frac{1}{15}$
B. $\frac{3}{8}$
C. $\frac{3}{25}$
D. $\frac{1}{125}$

125 — 15 alan

$\frac{15}{125} = 0.12 = \frac{12}{100} = 12\%$

$\boxed{\frac{3}{25}}$

42. Paul has a bag of candy that contains 6 red candies, 8 blue candies, and 4 green candies. If Paul pulls out 1 candy, then the probability that the candy will be either red or blue is

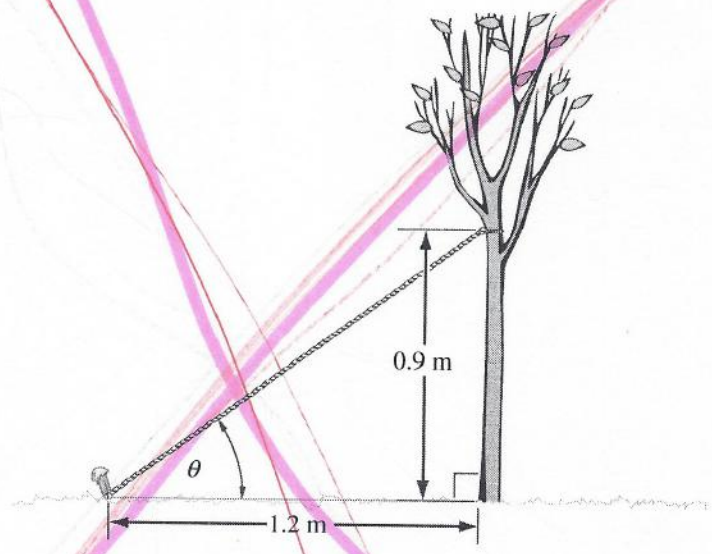
A. $\frac{1}{48}$
B. $\frac{2}{9}$
C. $\frac{7}{24}$
D. $\frac{7}{9}$

6r + 8B + 4G = 18

14 of 18 or $\frac{14 \div 2}{18 \div 2} = \frac{7}{9}$

Use the following information to answer question 43.

A newly planted tree is supported by a rope. The rope is attached to the tree at a height of 0.9 m and to a peg in the ground that is 1.2 m away from the base of the tree, as shown below.

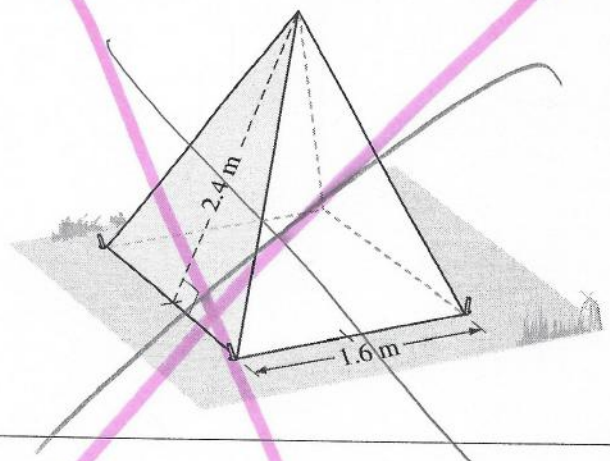


43. Rounded to the nearest degree, the angle, θ, between the rope and the ground is

A. 37°
B. 41°
C. 49°
D. 53°

Use the following information to answer question 44.

A tent has the shape of a square-based pyramid, as shown below.



44. Including the base, the surface area of the tent, to the nearest hundredth of a square metre, is

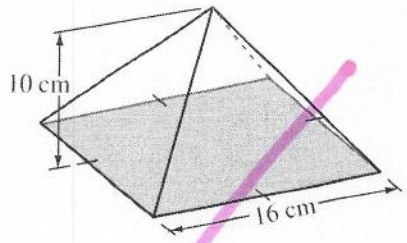
A. 15.36 m^2

B. 10.24 m^2

C. 7.68 m^2

D. 1.92 m^2

Use the following information to answer numerical-response question 6.



The formula for the volume of a square-based pyramid is
$V = \frac{1}{3}$ (Area of base) (height).

Numerical Response

6. The volume, to the nearest cubic centimetre, of the square-based pyramid shown above is 320 cm^3.

(Record your answer in the numerical-response section on the answer sheet.)

$V = \frac{1}{3}(16 \times 16) \times 10$

$V = 32 \times 10 = 320\ cm^3$

You have now completed the test.
If you have time, you may wish to check your answers.