Year 9 Term 2 Test Solutions

Student Name: _____	**Grade**: _____
Date: _____	**Score**: _____

- Answer the questions in the spaces provided on the question sheets.
- If you run out of room for an answer, continue on the back of the page.
- This test has 20 questions, for a total of 100 marks.
- Attempt all 20 questions.
- Time allowed: 45 minutes.

Page:	1	2	3	4	5	6	7	Total
Points:	12	16	14	17	16	13	12	100
Score:								

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11 Year 9 Term 2 Test Solutions

Question 1 ..... (8 points)

Solve each of these equations:

(a) $\frac{1}{3}x - \frac{3}{4}(x+2) = \frac{5}{6}x$ [4]

Solution:

$$4x - 9(x+2) = 10x$$
$$4x - 9x - 18 = 10x$$
$$4x - 9x - 10x = 18$$
$$-15x = 18$$
$$x = -1\frac{1}{5}.$$

(b) $\frac{x+4}{x-2} = \frac{x+8}{x-3}$ [4]

Solution:

$$(x-2)(x+8) = (x+4)(x-3)$$
$$x^2 - 2x + 8x - 16 = x^2 + 4x - 3x - 12$$
$$6x - x = 16 - 12$$
$$5x = 4$$
$$x = \frac{4}{5}.$$

Question 2 ..... (4 points)

Make y the subject for the following equations:

(a) $3(4x - 2y) = 18x - 3$ [2]

Solution:

$$12x - 6y = 18x - 3$$
$$-6y = 18 - 12x - 3$$
$$-6y = 6x - 3$$
$$y = \frac{6x-3}{-6} \text{ or } y = \frac{1-2x}{2}.$$

(b) $\frac{y}{y-6} = \frac{2x}{3}$ [2]

Solution:

$$2x(y-6) = 3y$$
$$2xy - 12x = 3y$$
$$2xy - 3y = 12x$$
$$y(2x-3) = 12x$$
$$y = \frac{12x}{2x-3}.$$

Question 3 ..... (4 points)

If $T = \frac{n}{2}[2a + (n-1)d]$, find T if a = 8, d = 5 and n = 4.

Solution:

$$\begin{aligned} T &= \frac{4}{2}[2 \times 8 + (4-1) \times 5] \\ &= 2[16 + 3 \times 5] \\ &= 62. \end{aligned}$$

Question 4 ..... (4 points)

Solve each of the following inequations:

(a) $2 - 4x \leq 18 - x$ [2]

Solution:

$$\begin{aligned} -4x + x &\leq 18 - 2 \\ -3x &\leq 16 \\ x &\geq \frac{16}{-3} \text{ or } x \geq -5\frac{1}{3}. \end{aligned}$$

(b) $\frac{2x}{3} - \frac{x}{4} \geq 24$ [2]

Solution:

$$\begin{aligned} 8x - 3x &\geq 288 \\ 5x &\geq 288 \\ x &\geq 57\frac{3}{5}. \end{aligned}$$

Question 5 ..... (4 points)

A rectangle is to be constructed with length x cm and width (x-4) cm. The perimeter of the rectangle is to be less than 42 cm. What are the possible values for x?

Solution:

$$\begin{aligned} [x + (x-4)] \times 2 &< 42 \\ (2x - 4) &< 21 \\ 2x &< 25 \\ x &< 12\frac{1}{2} \Rightarrow \therefore\ 4, x < 12.5 \end{aligned}$$

Question 6 ..... (4 points)

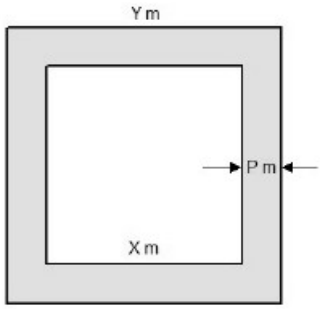
Find the area of a square whose perimeter is equal to an equilateral triangle with sides of 32 cm.

Solution:

$$\begin{aligned} \frac{32 \times 3}{4} &= 24 \\ A = 24^2 &= 576\, cm^2. \end{aligned}$$

Question 7 ..... (6 points)

Consider a square garden with sides x metres long. A path p metres wide surrounds a square area of lawn with side y metres, as shown in the figure below:



(a) Write down a formula for y in terms of x and p. [2]

Solution: $y = x + 2p.$

(b) If x = 25 m and p = 2.5 m, find the area of the path. [4]

Solution: $(25+5)^2 - 25^2 = 275\,m^2.$

Question 8 ..... (8 points)

Convert the following units:

(a) 2.3 L = [Answer: 2300]. mL. [2]

(b) $1.5m^2$ = [Answer: 15,000]. cm^2. [2]

(c) 10.2 ha = [Answer: 102,000]. m^2. [2]

(d) 1152 kg = [Answer: 1.152]. t. [2]

Question 9 ..... (4 points)

State the upper and lower bounds of each measurement:

(a) A mass of 6.25 kg. [Answer: $6.245\,kg - 6.255\,kg$]. [2]

(b) The height of a building is 158 m, correct to nearest metre [Answer: $157.5\,m - 158.5\,m$]. [2]

Question 10 ..... (4 points)

If a car travels at 18 m/s, what is the speed in km/h?

Solution:

$$\frac{18 \times 3600}{1000} = 64.8\,km/h.$$

Question 11 ..... (5 points)

A rectangular water container was filled with 4800 cm^3 of water to a level of 8 cm. Thirty similar marbles were put into the tank and the water level rose by 2 cm. Find the volume of each marble.

Solution:

$$V = A \times h \;\Rightarrow\; A = \frac{V}{h} = \frac{4800}{8} = 600\,cm^2$$

$$V = 600 \times 2 = 1200\,cm^3.$$

Each marble $1200 \div 30 = 40\,cm^3$.

Question 12 ..... (4 points)

The mean of a set of 29 scores is 78. When one of the scores is taken out of the set, the new mean is then 79. Find the score that was taken out.

Solution:

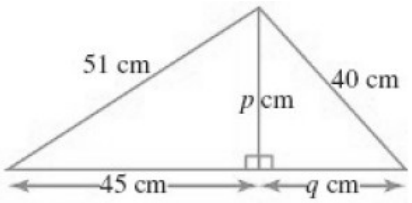
Total of $29 = 29 \times 78 = 2262$

Total of $28 = 28 \times 79 = 2212$

The score that was taken out $= 2262 - 2212 = 50$.

Question 13 ..... (4 points)

Find the values of p and q, then find the perimeter of following figure.



Solution:

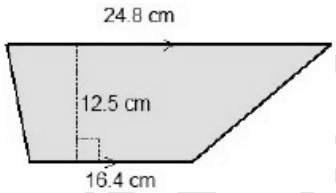
$p = \sqrt{51^2 - 45^2} = 24\,cm.$

$q = \sqrt{490^2 - 24^2} = 32\,cm$

Perimeter $= 40 + 51 + 45 + 32 = 168\,cm.$

Question 14 ..... (4 points)

Find the area of the trapezium:



Solution:

$A = \frac{1}{2}(16.4 + 24.8) \times 12.5 = 257.5\,cm^2.$

Question 15 ..... (8 points)

Use your calculator to find the mean and median of following set of scores, correct to 1 decimal place.

Score	1	2	3	4	5
Frequency	3	7	8	14	5

Solution:

Total score $= 122,$

Total frequency37, $\Rightarrow\ m = \frac{122}{37} = 3.29 \approx 3.3.$

(a) mean = [Answer: 3.3]. [4]

(b) median = [Answer: 4]. [4]

Question 16 ..... (4 points)

A card is drawn at random from a normal deck of 52 cards. What is the probability of it being:

(a) the five of spades? [Answer: $\frac{1}{52}$]. [2]

(b) a red heart? [Answer: $\frac{1}{4}$]. [2]

Question 17 ..... (4 points)

A bag contains 12 red marbles and 12 white marbles. If two marbles are drawn at random one at a time without replacement, what is the probability of drawing two red marbles?

Solution:

$$\frac{1}{2} \times \frac{11}{23} = \frac{11}{46}.$$

Question 18 ..... (5 points)

Simplify the following:

(a) $\sqrt{27x} - \sqrt{12x}$ [2]

Solution:

$$\begin{aligned}\sqrt{27x} - \sqrt{12x} &= 3\sqrt{3x} - 2\sqrt{3x} \\ &= \sqrt{3x}.\end{aligned}$$

(b) $54\sqrt{20} \times 6\sqrt{5}$ [3]

Solution:

$$\begin{aligned}54\sqrt{20} \times 6\sqrt{5} &= 324\sqrt{100} \\ &= 3240.\end{aligned}$$

Question 19 ..... (7 points)

Rationalise the denominator in each of these:

(a) $\frac{1}{\sqrt{6}-2}$ [3]

Solution:

$$\frac{1}{\sqrt{6}-2} = \frac{\sqrt{6}+2}{(\sqrt{6}-2)(\sqrt{6}+2)}$$
$$= \frac{\sqrt{6}+2}{6-4}$$
$$= \frac{\sqrt{6}+2}{2}.$$

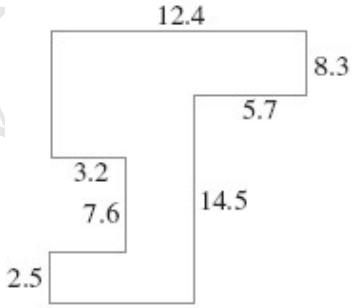
(b) $\frac{3+\sqrt{3}}{3-\sqrt{2}}$ [4]

Solution:

$$\frac{3+\sqrt{3}}{3-\sqrt{2}} = \frac{(3+\sqrt{3})(3+\sqrt{2})}{(3-\sqrt{2})(3+\sqrt{2})}$$
$$= \frac{9+3\sqrt{2}+3\sqrt{3}+\sqrt{6}}{7}.$$

Question 20 ..... (5 points)

Calculate the total perimeter of the following figure. All angles are right angles and all measurements are in cm.



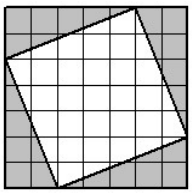
Solution:

$$(12.4 + 22.8) \times 2 + 2 \times 3.2 = 70.4 + 6.4$$
$$= 76.8\,cm.$$

11.1 Math challenge

Exercise 11.1.1

1. *What is the the ratio of the shaded to the unshaded area in the diagram shown below:*



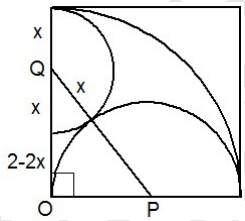
Solution:

The shaded area $A_1 = 4 \times (\frac{1}{2} \times 2 \times 5) = 20,$

The unshaded area $A_2 = 7^2 - A_1 = 49 - 20 = 29,$

$\therefore$ *the ratio of shaded to unshaded area is 20:29.*

2. *The diameter of the large semicircle and the radius of the quadrant are both 2 units. Find the radius of the smallest semicircle.*



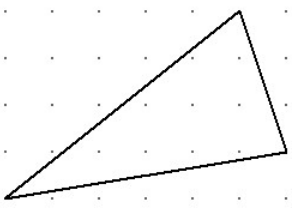
Solution:

Lest radius of the smallest semicircle be x. Then $OQ = 2 - 2x + x = 2 - x$

From right-angled$\triangle OPQ \Rightarrow (1+x)^2 = 1^2 + (2-x)^2$

$1 + 2x + x^2 = 1 + 4 - 4x + x^2 \Rightarrow x = 4 \Rightarrow \therefore \Rightarrow x = \frac{2}{3}.$

3. *Consider the triangle in the diagram is made on a 1 cm dot paper. Find the area of the triangle in square centimetres.*



Solution:

$A = I + B/2 - 1 = 9 + \frac{3}{2} - 1 = 9.5cm^2$

or $A = 24 - (10 + 1.5 + 3) = 9.5\,cm^2$

Exercise 11.1.2

1. *It $x : y = 5:6$ and $y : z = 4: 7$, what is the ratio of $x: y : z$?*

Solution:

$$\begin{cases} x : y = 5 : 6 \\ y : z = 4 : 7 \end{cases} \Rightarrow \begin{cases} x : y = 20 : 24 \\ y : z = 24 : 42 \end{cases}$$

$$\therefore \ x : y : z = 20 : 24 : 42 = 10 : 12 : 21.$$

2. *The ratio of Adam's investment to Bob's is 4:7 and Bob to Cathy is 3:8. If Cathy has $280,000, find the nearest dollar the Value of Adam's investment.*

Solution:

Given that $A : B = 4 : 7$, *and* $B : C = 3 : 8$

We have $A : B : C = 12 : 21 : 56 \ \Rightarrow \ A : C = 12 : 56$,

$\therefore$ *Adam's investment is:* $A = 280,000 \times 12 \div 56 = \$60,000.$

3. *If it takes 5 men 12 hours to complete a painting job, how long will it take 8 men to do the job working at the same rate?*

Solution:

For one man it will need $5 \times 12 = 60$ *hours to finish the job,*

for 8 men it will take $60 \div 8 = 7.5$ *hours.*

4. *Petrol and oil are mixed in the ratio 25:1 to make mower fuel. How much oil needs to be added to 4 litres of petrol to make the fuel? (Express your answer in the nearest mL.)*

Solution:

Petrol : oil = 25 : 1 $\Rightarrow$ *Prtrol : oil : fuel = 25 : 1 : 26*

$\therefore$ *oil needs to be added:* $= 4000 \div 25 = 160\, mL.$

5. *The ratio of tin to lead in a figurine is 7:5. How much tin is needed to mix with 17.5 g of lead to create a batch of figurines?*

Solution:

tin : lead = 7: 5 $\Rightarrow$ *tin* $: 17.5 = 7 : 5$

$$\therefore \ \textit{tin} = \frac{7 \times 17.5}{5} = 24.5\, g.$$