| NAME Memo | MARK |
|---|---|
| TEACHER | |
| CLASS | PERCENTAGE |

**HERZLIA MIDDLE SCHOOL**

**GRADE 9**

**MATHEMATICS EXAMINATION**

**PAPER 1**

**17 NOVEMBER 2016**

**TIME: 90 Minutes**

**MARKS: 100**

This paper consists of 14 pages

- ✡ All working details must be shown clearly.
- ✡ Marks will be deducted if work is set out incorrectly.
- ✡ Please note that diagrams are not necessarily drawn to scale.
- ✡ Calculators may be used.
- ✡ Unless convention or instructions dictate otherwise, round answers to two decimal places.
- ✡ It is in your own interest to write legibly and to present your work neatly

**Question 1**

1.1 From the list of numbers and table below, give all the numbers which are represented by: (5)

1.1.1 A: $\frac{1}{3}$, $\sqrt{\frac{16}{25}}$, $\frac{22}{7}$ ✓

1.1.2 B: $\sqrt{5}$ ✓

1.1.3 C: $\sqrt{9}$, $5$, $\frac{8}{2}$, $\frac{\pi}{\pi}$ ✓

1.1.4 D: $\sqrt{-4}$ ✓

1.1.5 E: $\sqrt[3]{-27}$ ✓

All or nothing (0) Part marks ↑

Penalize for extra numbers. 5

$\sqrt{9}$ $5$ $\frac{1}{3}$ $\sqrt{\frac{16}{25}}$ $\frac{8}{2}$ $\sqrt[3]{-27}$ $\sqrt{-4}$ $\frac{22}{7}$ $\sqrt{5}$ $\frac{\pi}{\pi}$

| Number | Non-Real | Real | Irrational | Rational | Integer | Whole | Natural |
|---|---|---|---|---|---|---|---|
| A | × | ✓ | × | ✓ | × | × | × |
| B | × | ✓ | ✓ | × | × | × | × |
| C | × | ✓ | × | ✓ | ✓ | ✓ | ✓ |
| D | ✓ | × | × | × | × | × | × |
| E | × | ✓ | × | ✓ | ✓ | × | × |

1.2 Does zero fit into any of these categories? (1)

No ✓

1

6

**Question 2**

2.1 The Earth moves in its orbit around the sun at a speed of about 107 000 km/hr.

2.1.2 Calculate how far the Earth travels in one full day. (1)

$107\,000 \times 24$ ✓

$= 2\,568\,000$ km ✓

1

2.1.3 Calculate the distance that the Earth travels in one year of $365\frac{1}{4}$ days. Write your answer in Scientific Notation, rounded off to 2 decimal places. (2)

$2\,568\,000 \times 365{,}25$ ✓

$= 937\,962\,000$ ✓

$= 9{,}38 \times 10^{8}$ km ✓

2

2.2 Simplify the following, leaving your answer in Scientific Notation. Do not use a calculator. Show all steps of working. (2)

$$\frac{(2{,}5\times10^{3})(6\times10^{4})}{3\times10^{8}}$$

$$= \frac{15\times10^{7}}{3\times10^{8}}$$ ✓

$$= 5\times10^{-1}$$ ✓

2

(5)

**Question 3**

Factorise the following.

3.1 $15a^3b + 45ab$ (1)

$= 15ab(a^2 + 3)$ ✓ 1

3.2 $x^2 - 11x - 26$ (2)

$= (x + 2)(x - 13)$ ✓ ✓ 2

3.3 $2x^3y - 14x^2y^2 + 12xy^3$ (3)

$= 2xy(x^2 - 7xy + 6y^2)$ ✓ ✓

$= 2xy(x - y)(x - 6y)$ ✓ 3

3.4 $4(a+b) - x^2(a+b)$ (2)

$= (a+b)(4 - x^2)$ ✓

$= -(a+b)(x^2 - 4)$

$= (a+b)(x+2)(x-2)$ ✓ 2

or $(a+b)(2+x)(2-x)$

3.5 $\dfrac{x^2 - 49}{7x^2 + 49x} \div \dfrac{2x - 14}{21x}$ (4)

$= \dfrac{(x-7)(x+7)}{7x(x+7)} \times \dfrac{21x}{2(x-7)}$ ✓ ✓ ✓

$= \dfrac{3}{2}$ ✓ 4

(12)

3.6 $\dfrac{2x^2-18}{2x^2+6x}\times\dfrac{(x-1)^2-1}{x^2-5x+6}$ (7)

$= \dfrac{2(x^2-9)}{2x(x+3)} \times \dfrac{((x-1)-1)((x-1)+1)}{(x-2)(x-3)}$

$= \dfrac{2(x-3)(x+3)}{2x(x+3)} \times \dfrac{x(x-2)}{(x-2)(x-3)}$

$= 1$

$= \dfrac{2(x^2-9)}{2x(x+3)} \times \dfrac{x^2-2x+1-1}{(x-2)(x-3)}$

$= \dfrac{2(x+3)(x-3)}{2x(x+3)} \times \dfrac{x^2-2x}{(x-2)(x-3)}$

$= \dfrac{2(x+3)(x-3)}{2x(x+3)} \times \dfrac{x(x-2)}{(x-2)(x-3)}$

$= 1$

**Question 4**

Simplify the following leaving your answer with positive exponents where necessary.
Do not use a calculator. Show all working.

4.1 $\sqrt[3]{\dfrac{27}{8}} + \sqrt{2\dfrac{1}{4}}$ (2)

$= \dfrac{3}{2} + \sqrt{\dfrac{9}{4}}$

$= \dfrac{3}{2} + \dfrac{3}{2}$

$= \dfrac{6}{2}$

$= 3$

2

4.2 $\dfrac{-3x^0y^{-2}}{15x^{-3}y^4}$ (2)

$= -\dfrac{x^3}{5y^6}$

2

4.3 $\dfrac{(5x^{-3}y)^2}{-4xy} \div \dfrac{\sqrt{25x^4y^{-2}}}{2x^3}$ (4)

$= \dfrac{25x^{-6}y^2}{-4xy} \div \dfrac{5x^2y^{-1}}{2x^3}$ ✓ ✓

$= \dfrac{25y^2}{-4x^7y} \times \dfrac{2x^3y}{5x^2}$ ✓

$= \dfrac{5x^3y^3}{-10x^9y}$

$= \dfrac{5y^2}{-2x^6}$ ✓

4

4.4 $(x-3)(5x+4)-5(x+4)^2$ (4)

$= 5x^2 + 4x - 15x - 12 - 5(x^2 + 8x + 16)$ ✓ ✓

$= 5x^2 - 11x - 12 - 5x^2 - 40x - 80$ ✓

$= -51x - 92$ ✓

4

8

4.5 $\frac{2}{3} - \frac{1}{2}(3x-2) - \frac{3}{4}(2x+5)$ (4)

$= \frac{8 - 6(3x-2) - 9(2x+5)}{12}$

$= \frac{8 - 18x + 12 - 18x - 45}{12}$

$= \frac{-36x - 25}{12}$

4

**Question 5**

Solve for the unknown variable in the following equations.

5.1 $5(2y-1) = 9(y+1) - 8$ (3)

$\therefore 10y - 5 = 9y + 9 - 8$

$\therefore 10y - 9y = 6$

$y = 6$

3

5.2 $2x^3 + 1 = 55$ (2)

$\therefore 2x^3 = 54$

$x^3 = 27$

$x = 3$

2

5.3 $7^{x-2} = 1$ (2)

$\therefore 7^{x-2} = 7^0$

$x - 2 = 0$

$x = 2$

2

11

5.4 $\frac{x+3}{4}-\frac{x+2}{8}=\frac{x}{2}-1$ (4)

(x8) $\therefore 2(x+3)-(x+2)=4x-8$ ✓

$\therefore 2x+6-x-2=4x-8$ ✓

$\therefore -3x=-12$ ✓

$\therefore x=4$ ✓

4

5.5 $5x^2-125=0$ (2)

$\therefore 5x^2=125$ ✓

$\therefore x^2=25$

$\therefore x=5$ ✓ or $x=-5$ ✓

(or) $5(x^2-25)=0$

$5(x+5)(x-5)=0$

$\therefore x=-5$ or $x=5$

2

(or) $x^2-25=0$

$(x+5)(x-5)=0$

$x=5$ or $-5$

5.6 $2x^2-2x=24$ (3)

$\therefore 2x^2-2x-24=0$ ✓

$\therefore 2(x^2-x-12)=0$

$\therefore 2(x+3)(x-4)=0$ ✓

$\therefore x=-3$ ✓ or $x=4$ ✓

(OR) $x^2-x=12$

$x^2-x-12=0$

$(x+3)(x-4)=0$

$x=-3$ or $4$

3

9

**Question 6**

6.1.1 Jordan decided to sell bracelets for R90, earings for R120 and necklaces for R140. She sold $\frac{1}{3}$ as many bracelets as necklaces and 3 more earings than bracelets. In total she made R1620. How many necklaces did Jordan sell? (4)

Let bracelets sold = $x$

| B | E | N |
|---|---|---|
| $x$ | $x+3$ | $3x$ |

$\therefore 90x + 420x + 120(x+3) = 1620$ ✓

$\therefore 90x + 420x + 120x + 360 = 1620$

$\therefore 630x = 1260$

$\therefore x = 2$ ✓

4

$\therefore$ Jordan sold ... necklaces ✓

6.1.2 If it cost Jordan R520 to make all the jewellery, calculate her percentage profit rounded off to the nearest whole percent. (2)

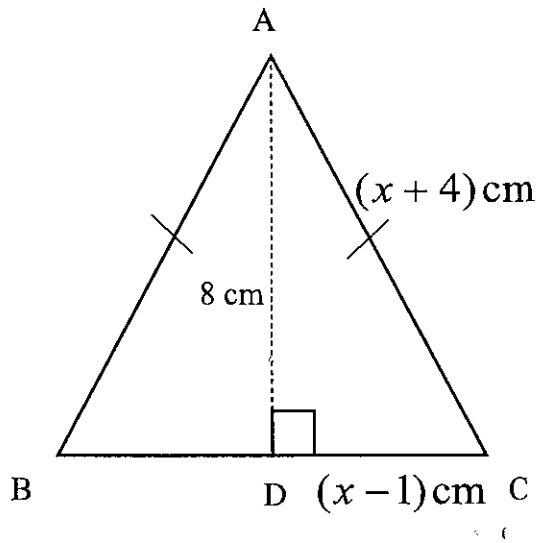
$1620 - 520 = 1100$

$\frac{1100}{520}$ ✓ $= 212\%$ ✓

2

(6)

**Question 7**




7.1 $\Delta ABC$ is an isosceles triangle with $AC = (x+4)\,cm$; $AD = 8\,cm$; and $DC = (x-1)\,cm$. Use the theorem of Pythagoras to determine the value of $x$. (5)

$AD^2 + DC^2 = AC^2$ (Pythag in $\Delta ABC$)

$\therefore 64 + (x-1)(x-1) = (x+4)(x+4)$ ✓

$\therefore 64 + x^2 - 2x + 1 = x^2 + 8x + 16$ ✓ ✓ 5

$\therefore x^2 - 2x - x^2 - 8x = 16 - 1 - 64$

$\therefore -10x = -49$ ✓

$\therefore x = 4,9\,cm$ ✓

7.2 Hence, calculate the area of $\Delta ABC$. (3)

$A = \frac{b \times h}{2}$

$= \frac{2(3,9) \times 8}{2}$

$= 31,2\,cm^2$

$A = \frac{2(x-1).8}{2}$ ✓

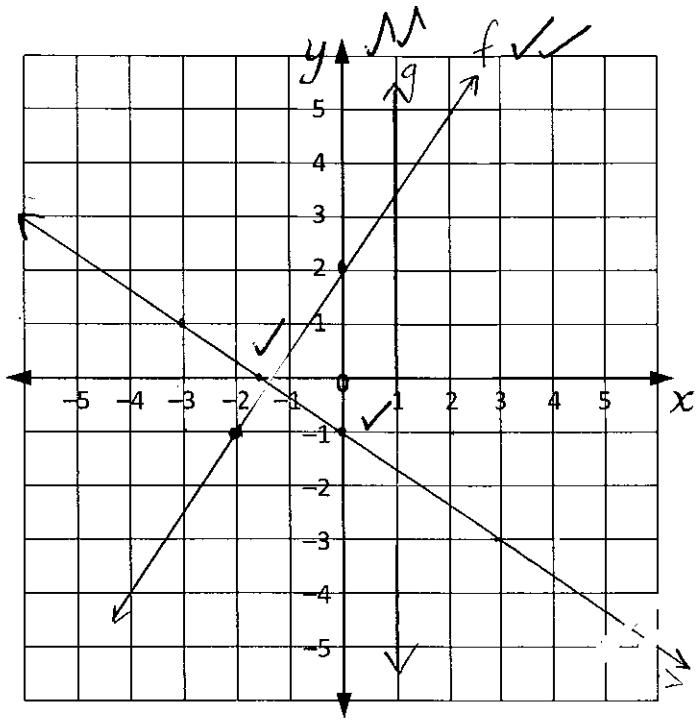
$= 8x - 8$

$= 8(4,9) - 8$ ✓

$= 31,2\,cm^2$ ✓ 3

(8)

**Question 8**




8.1 Plot the following lines on the above Cartesian Plane:

$f: \ y = \frac{3}{2}x + 2$ (2)

$g: \ x = 1$ (1)

$h: \ -3 = 2x + 3y$ (5)

Let $x = 0$: $-3 = 3y$, $y = -1$, $(0; -1)$

Let $y = 0$: $-3 = 2x$, $x = -\frac{3}{2}$, $(-1\frac{1}{2}; 0)$

$-3 = 2x + 3y$

$3y = -2x - 3$

$y = -\frac{2}{3}x - 1$

8.2 Write down the point of intersection of $f$ and $g$. (1)

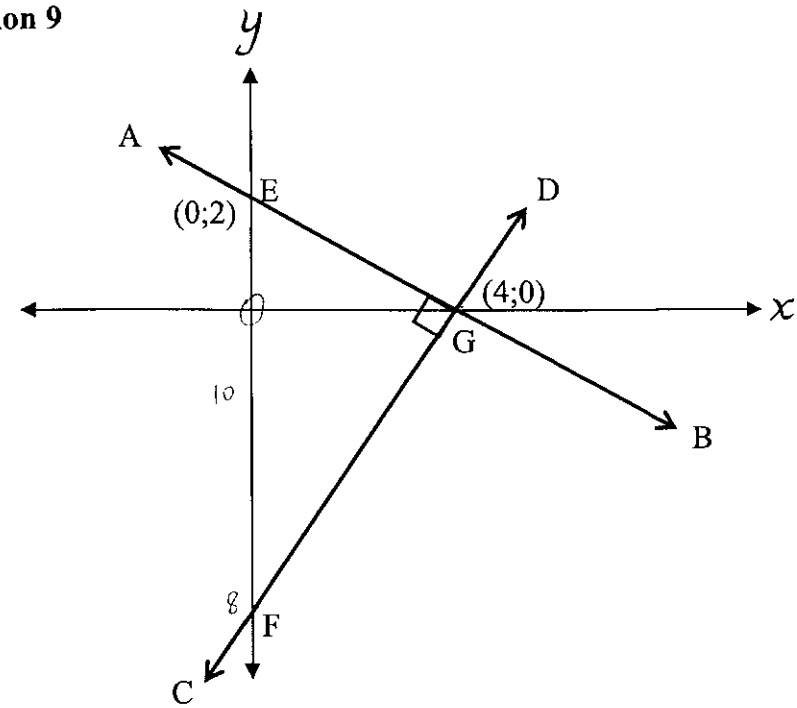
$(1; 3\frac{1}{2})$

8.3 Classify the triangle enclosed by line $f$, $g$, and $h$. (1)

Right angled Scalene.

10

**Question 9**




9.1 What is the equation of line AB? (2)

$y = -\frac{1}{2}x + 2$ ✓ ✓

2

9.2 If CD ⊥ AB what is the equation of CD? (3)

$y = 2x - 8$ ✓ ✓

$y = 2x + c$
$0 = 2(4) + c$ ✓
$\therefore c = -8$ ✓

3

9.3 Calculate the area of $\Delta EFG$ (2)

$A = \frac{b \times h}{2}$ ✓

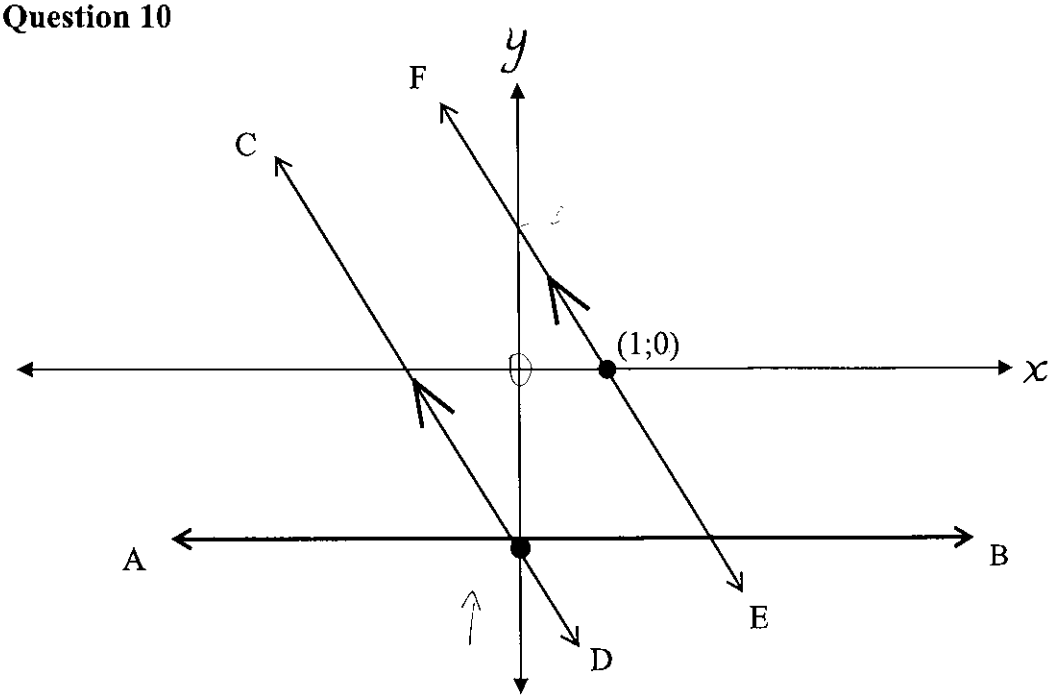
$= \frac{10 \times 4}{2}$

$= 20$ units$^2$ ✓

2

7

**Question 10**




10.1 If the equation of line CD is $2y = -6x - 8$, determine the equation of AB (2)

$2y = -6x - 8$

$y = -3x - 4$ ✓

AB is $y = -4$ ✓

2

10.2 Determine the equation of EF (3)

$y = -3x + 3$ ✓ ✓

$y = -3x + c$ ✓

$0 = -3(1) + c$

$\therefore c = 3$ ✓

3

10.3 Determine the point of intersection of line EF and AB. (2)

$y = -3x + 3$

$-4 = -3x + 3$ ✓

$3x = 3 + 4$

$x = \frac{7}{3}$ ✓

$x = 2\frac{1}{3}$

point of intersection is $(2\frac{1}{3}; -4)$ ✓

2

7

BONUS QUESTIONS

1. If $x^2 + y^2 = 10$ and $xy = 3$, what is the value(s) of $x + y$? (2)

$2xy = 6$ ✓

$\therefore x^2 + 2xy + y^2 = 16$

$(x+y)(x+y) = 16$

$\therefore x+y = 4$ or $x+y = -4$ ✓

2. A train travelling at 60 km/hr takes 15 seconds to pass you. How long is the train? (1)

60 000m / 3600s

250m / 15s

250m long ✓

3. Three coins are tossed at the same time. What is the probability of two tails and one head showing? (1)

$\frac{3}{8}$ ✓

(4)