Additional Mathematics Exercise 10 Answers

(*Vectors*)

1. (a) $\mathbf{p}-\mathbf{q}$ (b) $\frac{1}{3}(\mathbf{p}-\mathbf{q})$

   (c) $\frac{2}{3}(\mathbf{q}-\mathbf{p})$ (d) $\frac{1}{3}(\mathbf{p}+2\mathbf{q})$

2. (a) $\frac{1}{3}\overrightarrow{\mathrm{AD}}$ (b) $\overrightarrow{\mathrm{CD}}=\frac{1}{3}\overrightarrow{\mathrm{AB}},\ \overrightarrow{\mathrm{CB}}=\frac{5}{6}\overrightarrow{\mathrm{AB}}$

3. (a) $m = 0, n = 6$ (b) $m = 4, n = 3$

4. $\frac{10}{11}$

5. (a) $\overrightarrow{\mathrm{PR}}$ (b) –

6. (a) 16 (b) 16 (c) 5

7. (a) $\frac{2}{5}(\mathbf{d}-\mathbf{c})$ (b) $\frac{1}{5}(\mathbf{b}-\mathbf{c})$ (c) $\frac{1}{5}(\mathbf{b}+\mathbf{c}-2\mathbf{d})$

8. (a) $\overrightarrow{\mathrm{ZP}}=-\frac{1}{2}(\mathbf{a}+\mathbf{c}),\ \overrightarrow{\mathrm{ZQ}}=\frac{1}{2}(\mathbf{c}-\mathbf{b}),\ \overrightarrow{\mathrm{ZR}}=\frac{1}{2}(\mathbf{b}+\mathbf{c}),\ \overrightarrow{\mathrm{ZS}}=\frac{1}{2}(\mathbf{a}-\mathbf{c})$

   (b) –

9. $\left|-3\mathbf{i}+4\mathbf{j}\right|=5,\ \theta=126.9°$

10. (–20, 12)

11. (a) $-\mathbf{i}$ (b) $\frac{1}{17}(-8\mathbf{i}+15\mathbf{j})$

12. (a) $\mathbf{i}=\frac{1}{19}(3\mathbf{a}+5\mathbf{b}),\ \mathbf{j}=\frac{1}{19}(2\mathbf{a}-3\mathbf{b})$ (b) $-\frac{2}{19}(4\mathbf{a}+13\mathbf{b})$

13. $\frac{8}{25}(24\mathbf{i}+7\mathbf{j}),\ -\frac{8}{25}(24\mathbf{i}+7\mathbf{j})$

14. (a) $-3\mathbf{i}-4\mathbf{j}$

    (b) (i) $9\mathbf{i}+12\mathbf{j},\ -9\mathbf{i}-12\mathbf{j}$ (ii) (11, 13), (–7, –11)

15. (a) $(2+3k)\mathbf{i}+(6-7k)\mathbf{j}$ (b) 2, $\frac{16}{29}$

16. $5\mathbf{i}-\mathbf{j}$

17. $\mathbf{h}-\mathbf{k}$

18. (a) $\overrightarrow{\mathrm{OA}}-\overrightarrow{\mathrm{OG}}$ (b) –

19. $\overrightarrow{\mathrm{MN}}=\frac{1}{2}(\mathbf{b}+\mathbf{d}-\mathbf{a}-\mathbf{c})$

20. (a) $\mathbf{c}=\frac{1}{k+1}(k\mathbf{a}+\mathbf{b}),\ k\neq -1$ (b) $\frac{2}{3}$

21. (a) $\frac{1}{4}(3\mathbf{p}+\mathbf{r})$ (b) $\frac{1}{m+n}(2n\mathbf{p}+m\mathbf{r})$ (c) 2 : 3

22. (a) $\frac{2\mathbf{r}+\mathbf{s}}{3}$ (b) 7

23. (a) $\frac{1}{3}(2\mathbf{a}+\mathbf{b})$ (b) $\frac{1}{3}(4\mathbf{b}-\mathbf{a})$ (c) –

24. (a) $\overrightarrow{\mathrm{PX}}=\frac{1}{\lambda+1}\left(\frac{\lambda}{2}\mathbf{r}-\mathbf{p}\right)$, $\overrightarrow{\mathrm{YR}}=\frac{1}{\mu+1}\left(\mathbf{r}-\frac{\mu}{2}\mathbf{p}\right)$

(b) –

25. (a) $\overrightarrow{\mathrm{AB}}=-14\mathbf{i}-8\mathbf{j}$, $\overrightarrow{\mathrm{OP}}=9\mathbf{i}+6\mathbf{j}$, $\overrightarrow{\mathrm{OQ}}=3\mathbf{i}+6\mathbf{j}$, $\overrightarrow{\mathrm{PQ}}=-6\mathbf{i}$

(b) $(15-14h)\mathbf{i}+(10-8h)\mathbf{j}$

(c) $(9-6k)\mathbf{i}+6\mathbf{j}$

(d) $h=\frac{1}{2}$, $k=\frac{1}{6}$

26. (a) –1 (b) 123

27. (a) 45° (b) 63°

28. (a) 5 (b) 225

29. (a) $\frac{5}{2}$ (b) 63.43°

30. 8, –8

31. –

32. –

33. (a) – (b) –

34. –

35. (a) $\overrightarrow{\mathrm{OM}}=\mathbf{a}+\frac{1}{2}\mathbf{b}$, $\overrightarrow{\mathrm{ON}}=\frac{1}{2}\mathbf{a}+\mathbf{b}$

(b) –

(c) 143.1°

36. (a) $\overrightarrow{\mathrm{AQ}}=\mathbf{u}+(1-k)\mathbf{v}$, $\overrightarrow{\mathrm{DP}}=(1-k)\mathbf{u}-\mathbf{v}$

(b) –

37. (a) $\overrightarrow{\mathrm{PQ}}=-3\mathbf{i}+11\mathbf{j}$, $\overrightarrow{\mathrm{PR}}=3\mathbf{i}+15\mathbf{j}$

(b) (i) $\overrightarrow{\mathrm{PQ}}-\overrightarrow{\mathrm{PS}}$ (ii) 2 : 1

38. 90°

39. (a) –

(b) (i) 1 : 4 (ii) $\overrightarrow{\mathrm{OP}}=\frac{1}{2}(3\mathbf{i}-\mathbf{j})$, $\overrightarrow{\mathrm{PA}}=\frac{1}{2}(3\mathbf{i}+9\mathbf{j})$